

THE AMERICAN JOURNAL
...OF..
OPHTHALMOLOGY.

VOL. XVI.

OCTOBER, 1899.

NO. 10.

ORIGINAL ARTICLES.

CLINICAL MEASUREMENTS OF PUPILLARY
REACTION.*

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WHETHER undertakes to examine the literature of pupillometry is soon impressed with three facts:

First—By the rather large number of ingenious and careful studies made, especially of late years, to determine the absolute size of the pupil.

Second—By the comparatively small number of studies to ascertain the frequency, the rapidity or degree of variations in its size, or the causes which produce these variations.

Third—By the fact that while these methods of investigation are well adapted to laboratory experiment, they are of so little clinical value that practitioners have not yet availed themselves of them to any extent, in spite of the importance of the symptomatology of the pupil.

In a single paper it is only possible to indicate briefly, from the clinical standpoint, the various factors in the problem of pupillometry and to refer to an instrument which apparently is of some practical value as a pupillometer. In a subsequent paper more detailed description will be given as to the character and frequency of the movements of the pupil, thus shown.

In all measurements of the pupil there are, of course, two

*Read at the Thirty-fifth Annual Meeting of the American Ophthalmological Society, New London, Conn., July 19 and 20, 1899.

aspects of the problem: the pupil, and the instrument with which it is measured. The variations of the former and the imperfections of the latter constitute the difficulties presented. It should be remembered, of course, at the outset, that the absolute size of the pupil is of relatively little importance, varying, as it does, in different individuals, and being smaller in advanced life than in youth. Silberkuhl¹ has given us the latest and probably the best figures as to the average size, that is, in young people, from 15 to 20 years, 4 millimeters ($4\frac{1}{10}$); in persons of about 50 or more at 3 millimeters in diameter, while between 20 and 50 it varies from $3\frac{6}{10}$ to $3\frac{1}{10}$.

We have, therefore, to review briefly the four factors which produce changes in its size, even though in doing so it is necessary to recall facts already familiar. We naturally think first of variations due to intensity of illumination. That means, of course, that any measurements of the pupil, to be accurate, must bear a definite relation to photometric standards. For very exact measurements a photometer is an undoubted necessity, but in Schirmer's² article, he says that "if the window be covered with two white curtains, which either alone or together can be drawn down, the amount of illumination can be sufficiently regulated." This is also sufficient for most of the clinical examinations made to determine whether or not the iris still retains a considerable amount of mobility.

A very convenient photometer, also, is the radiometer of Crook. Many years ago it was suggested at this Society that this instrument could serve as a photometer, and although it has since been ascertained that the radiometer is influenced by electrical waves, we have also learned more recently from Tesla of the identical behavior, in many respects, of light and electricity, so that any objection to the radiometer is of less weight than formerly.

As we know also that the iris contracts with all efforts at accommodation, let us next glance at the bearing of this upon measurements of the pupil. It is undoubtedly true that when an intelligent subject gives time and patience to the tests, he can be taught to fix a distant object and then one nearer at

¹Graefe's Archiv für Ophthalmologie, 1896, Vol. XLII., Abtheilung III., page 179.

²Graefe's Archiv für Ophthalmologie, 1894, Abtheilung V., p. 12.

will, maintaining the accommodation thus for certain points only. On the other hand, I am convinced that most persons, not trained to such tests, practice what may be called unconscious accommodation with accompanying variations of efforts at convergence. This unconscious accommodation has long been recognized and references to it more or less complete, constantly appear in ophthalmological literature. In *Graefe's Archiv* for 1894, there is an excellent article on "Accommodation and Convergence," by Alfred Graefe, in which this principle is well recognized, although the subject has not yet been elaborated as fully as the relation of accommodation to convergence.

The existence of such unconscious efforts is shown by the almost constant changes in the size of the pupil visible under magnification, even after all other variable factors have been as nearly as possible eliminated. Unconscious accommodation is also indicated by the varying and therefore unreliable nature of our tests of convergence. These tests, either with the rod, phorometer, or other varieties of the prism, may show at one minute a latent convergence of a certain number of degrees, or again, at the end of a few days, or hours, or minutes, we may find the amount of muscular abnormality decidedly different. This is an important point, and influences our conclusion not only as to the mobility of the iris, but as to those obscure muscular conditions for which tenotomies were once more fashionable than at present.

A third group of causes tending to vary the size of the pupil relates to the respiration and circulation. We know, of course, that the pupil dilates with deep inspiration, and that to a certain extent it is influenced by variation in the pulse and blood pressure. With a little care, however, an intelligent subject can be taught to breathe so regularly, that barring pathological conditions of the circulation, this group of causes can be eliminated as a factor in the variation of the size of the pupil.

A fourth factor includes what may be called the psychic causes. These are, naturally, more difficult to estimate perhaps than any other, unless it be, as just mentioned, our control over the tendency to accommodation and convergence. In an exhaustive monograph on "The Movements of the Pupil," by Leeser, as far back as 1881, he calls attention to the importance of this group of causes, showing how sudden fright

will cause wide dilatation, as also the changes which take place in the more moderate dilatation when laughing. It is probable that these or other emotions vary the size of the pupil in a certain degree.

Having thus glanced hastily, as was necessary, at the four different factors which tend to change the size of the pupil, let us pass to the next part of the problem, that is, the instrument with which the pupil is measured.

Estimates of size are made, as we know, in a rough way, by holding a circular opening or a measure in front of the pupil and reading off the diameter (Follin, Lawrence), or it may be measured by a reflecting prism (Schirmer³ and Silberkuhl⁴). It was long ago discovered that the ophthalmometer was also an excellent pupillometer, but as Du Bois Raymond has pointed out, that instrument can be used only when the light is strong and consequently the pupil smaller and more immovable than normal.

The object of these methods is to determine the absolute diameter, but while the studies in this direction have been careful and exact, the fact remains that the pupil is in almost constant motion and the diameter at one instant is certain to change a few seconds later. As before remarked, therefore, the absolute size is of comparatively little importance, within certain limits, and our attention is directed principally to the number of the contractions within a certain time, their degree and their rapidity.

One of the earliest studies to determine the time required for pupillary contraction was made in 1869 by Arlt,⁵ who attempted to measure the rapidity of accommodation and consequent pupillary contraction; more recent studies on this point being by Seashore⁶ and others. Bellarminoff⁷ has measured not only the rapidity of the contractions but their degree and number within a certain time, and his apparatus is so ingenious as to deserve a word of description. He made

³Graefe's *Archiv für Ophthalmologie*, Vol. LX., Abtheilung V.

⁴Graefe's *Archiv für Ophthalmologie*, Vol. LXII., Abtheilung III.

⁵Graefe's *Archiv für Ophthalmologie*, Vol. xv., Abtheilung I.

⁶Studies from the Yale Psychological Laboratory, 1892-1893.

⁷*Archiv für die Gesamte Physiologie des Menschen u. der Thiere*, Pflueger, 37, 1885.

use of a camera so constructed that after focusing the eye upon the ground glass plate he could remove this plate and place in its stead a diaphragm having a small vertical slit, behind which slit there was passed a roll of photographic film, operated by clock-work, very much as the film in the ordinary hand-camera is rolled from one spool to another. As the pupil is black when its picture is focused on the sensitive paper no image is photographed, but each contraction of the pupil makes the vertical slit smaller from above downwards and each dilation makes the vertical slit wider from above downwards, thus varying the width of the band photographed on the paper as it passes behind the slit. By this contrivance "photograms" are produced which show not only the number of variations in the size of the pupil, but also their degree with an exactness which had been impossible before.

These various methods are mentioned, and the list might be extended almost indefinitely by citing other investigations, in order to show what has been the aim of work in this direction and also how little it is adapted to the needs of the working ophthalmologist. For this reason, especially, it seems warrantable to call attention to a modification of a principle which, though mentioned last, is not the latest chronologically. By this method a magnifying glass is placed before the eye, thus giving a better view of each variation in the size of the pupil and a graduated scale is interposed between the magnifying glass and the observer. The simplest form of this is shown in such crude instruments as were proposed by Carl Ferger and others.

Gradually this became more perfect. Of late the scale has been adapted to a large horizontal microscope which is here presented, which furnishes us with as convenient and complete a pupillometer as has yet been found. In going over the literature of the subject, I find that in 1882 Schadow,⁸ of Crefeld, published an article on the physiological movements of the iris, in which he mentions the use of an instrument constructed somewhat on this principle, and says that Prof. Colrausch, of Wuerzburg, has already constructed the pupillometer on the same principle in 1879. In the description which follows, however, it is evident that neither the instrument used by Colrausch nor that employed by Schadow are as exact or reliable as is

⁸Graefe's Archiv für Ophthalmologie, Vol. xxviii., Abtheilung III.

the pupillometer to which I would call attention. This instrument, which was devised by Mr. Henry L. DeZeng, of Buffalo, was described as a whole in the *New York Medical Journal* of June 17th, and in that description mention was made incidentally of its use as a pupillometer.

It seems worth while, however, thus to call more special attention to its evident advantages in this respect. For use as a pupillometer it is only necessary to place in the tube a micrometer scale similar in principle to the ordinary micrometer eye-piece of the microscope. With this each variation of the iris is not only magnified, but the degree can be measured simply and easily. In order to obtain the best results it is well to have the patient rest the chin in his hands, the elbows in turn resting on the table. Even this position is sufficient to hold the head quite firmly.

Still better, however, is it when a firm upright bar is made fast to a table by a set-screw, the upper part of the bar bearing a head-rest against which the forehead can be brought, while a piece of wood, supported in a convenient place for the teeth, is held firmly in the mouth by the patient, this being the same principle as that utilized by Stevens in his tropometer.

Such a microscope, with the micrometer eye-piece and with a good head-rest, enables an observer with ease and accuracy to measure not only the size, but the movements of the pupil, in such a manner as to be of real clinical value.

A CASE OF EMBOLUS OF A BRANCH OF THE CENTRAL RETINAL ARTERY.

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ON August 23, 1897, Mrs. G. J., 30 years of age, came to my office with the following history: On the evening of the 19th, four days previously, she had noticed a peculiar, odd feeling in the eyes, as she described it, with some blurring and a considerably diminished vision lasting up to the time of

her visit. I was unable to elicit anything more definite as to the attack by further inquiry. There had been no pain or other discomfort. The difficulty was confined to the left eye. There was no history of previous trouble with her eyes and she had always been able to see well and to use the eyes with entire comfort. There was no history of headache. On examination I found that the vision in O. D. = $\frac{6}{71}$; O. S. = $\frac{6}{15}$. Javal's ophthalmometer showed only a very low degree of astigmatism in either eye. Examination with the ophthalmoscope showed the fundus of the right eye normal and about emmetropic. In the left eye the media were entirely clear, the disc was of moderate size, there was a slight pigment ring with pigment crescent outward, a central physiological cup, venous pulse, some striations, the vessels were of good size, and the eye was about emmetropic. Extending from the disc outwardly beyond the macula was a long narrow area of paleness, about a disc diameter in width, the lower margin being just above the macula. With the pupil dilated this pale area showed very distinctly extending a considerable distance beyond the macula toward the temporal region, gradually fading into the normal retinal color. Extending from about the center of the disc outward through the middle of this pale area was a small branch of the central retinal artery. In this vessel just inside of the disc margin was a spot of obliteration, the vessel beyond this, however, being only slightly smaller than the portion on the disc side. It was extremely difficult to determine the origin of this lateral vessel, as it seemed to come directly from behind the superior temporal branch. Just beyond the edge of the disc this vessel was looped backward and partly concealed in the hazy swollen tissue of the retina, but further on it became clear. The upper margin of the pale area was clearly defined and was not apparently limited by any vessel, while the lower margin was limited by the small terminal branches of the superior retinal vein above the macula. Portions of the retina close to these small venous branches seemed to be much darker than the intervening spaces, giving much the appearance of the fingers of a glove, the vessels corresponding to the spaces between the fingers. It seemed to me that there could be no question that the small obstruction in this region was an embolus, as it was perfectly distinct and there was no difficulty in making out its character. The embolus was seen by Dr. Bruner, who agreed with me as to

the character of the obstruction. The field, taken upon the McHardy perimeter, indicated the peripheral portion of the field normal, both objective and for color. There was, however, in the central portion a large complete scotoma, extending from the fixation point downward 10 degrees, downward and inward 20 degrees, inward and slightly downward 15 degrees, outward about 5 degrees, the scotoma being entirely below the fixation point and most extensive in the lower nasal direction. On the 24th, four days after the previous examination, the ophthalmoscope showed that the obstruction in the artery had entirely disappeared, leaving the vessel of fairly good size through its entire length, only the loop was still partially concealed in the swollen retina. The general paleness of the retina remained about the same, both as to intensity and extent. At this time the patient was referred to Dr. E. F. Cushing for an examination as to her general condition. A note from him indicates that "there was no cardiac disease, the pulse was perhaps of rather high tension, but there was no other evidence of arterio-sclerosis." There was also no history of other trouble so far as could be ascertained.

On the 3rd of September following, another examination showed that the vision had improved to $\frac{6}{xviii}$. The caliber of the vessel previously referred to was slightly diminished in size and the pale area in the retina had perceptibly diminished both in extent and in the intensity of the pallor. The field, however, taken at this time, showed no diminution of the scotoma. The patient was next seen on the 10th of September, when there was unquestionably a diminished caliber of the artery through its entire course, but ophthalmoscopically there seemed to be no special change in the fundus and the vision remained the same as noted above. The patient was last seen on October 13, 1898. The vision at that time was $\frac{6}{xxx}$ and the ophthalmoscopic condition had not materially changed nor was there any diminution in the size of the scotoma. There was a slight granular condition of the macular and peri-macular region and still some paleness remaining in the area of the retina previously affected. So far as close reading was concerned she could not read ordinary-sized print on account of the scotoma. She stated that in April, 1898, she had noticed a small tumor in the left breast, which had been removed, and her surgeon reports that the growth was an adenoma.

It will be noted, that in a year's time, while the embolus, which was in view, had disappeared promptly, there remained a damage of the entire area of the retina which was first involved, the scotoma remained complete and of the same size during this period, while the general paleness of the area materially diminished but did not entirely pass away. It seems almost incredible that an embolus of this small branch should have produced so marked a disturbance and that on its disappearance the symptoms should not subside. As a rule, an embolus of the central retinal artery produces a very much more extensive area of paleness with the characteristic cherry-red appearance of the macula, both of which in this case were absent, only a narrow portion of the retina being involved. This condition, together with the absence of any atrophic changes in the disc, would indicate that there was not an embolus of the central retinal artery but of the temporal branch above indicated. An interesting fact in this connection also is that the symptoms and damage done to a certain portion of the retina are not necessarily relieved by the disappearance of the embolus itself and by the partial restoration of the function of the arterial branch. Whether the injury to the tissues remains as a result of the inflammatory action which is set up by the embolus or whether an embolus of another small branch supplying this area may have occurred it is impossible to say. One would certainly suppose that the disappearance, ophthalmoscopically, of the embolus would effect a much more marked change in the area of the scotoma than was present in this case, especially as there was a decided diminution in the area of paleness as well as in the intense pallor over the entire retinal portion involved. As to treatment, very little was attempted in this case other than some massage of the eyeball which the patient was directed to follow out.

I have deemed the case one worthy of record on account of the ophthalmoscopic presence of the embolus which was perfectly manifest, because of its disappearance in a day or two and on account of the permanent injury which has remained with no appreciable diminution in the size of the scotoma.

A CASE OF TUBERCULOSIS OF THE CONJUNCTIVA.

BY F. L. HENDERSON, M.D., ST. LOUIS, MO.

IN April, 1898, Mrs. H., 56 years of age, noticed a slight discharge of pus from the right eye. At the same time the upper lid seemed thickened. The attention of her family physician was called to this and, upon everting the lid, he found in the center of the palpebral conjunctiva a small discharging sinus which appeared to be nothing more than the opening of a Meibomian cyst. He prescribed an antiseptic collyrium which was of no avail, the small point gradually developing into an open ulcer. About the 1st of September the patient consulted an oculist and received the following treatment: "The application once a day of a solution of nitrate of silver (gr. j to $\frac{3}{4}$ j) followed by a wash consisting of a solution of borax (gr. x to $\frac{3}{4}$ j)." After treatment had been regularly administered for a month and since, in spite of it, the eye was slowly getting worse, the patient consulted me. Two days before I was called, Mrs. H. had accidentally fractured the neck of the left femur and I found her on her back with the leg suspended. The right eyelid presented some swelling and ptosis. Upon everting it, a deep umbilicated ulcer was found occupying the palpebral conjunctiva, midway between the outer and inner canthus. It was shaped like a horse-shoe, the open end extending back into the fornix, the toe or round end coming within about 3 mm. of the lid border. It was about 5 mm. wide. The bottom of the ulcer was grayish in color and was filled with pus. The raised border of the ulcer was granular and bled freely if touched. Where the palpebral conjunctiva was free from the ulcer it was thick, velvety, and of a deep red. In all other respects the eye was normal and the left eye seemed entirely so. The pre-auricular and cervical glands of the right side were significantly enlarged, being round and hard. I also got a history of a daily rise in temperature covering the past few months. This fever had been looked upon and treated as malaria.

For a few days I applied a 2 per cent. solution of nitrate of silver with no result except that it greatly augmented the patient's discomfort. I then ordered frequent cleansing with a 1 to 5000 bichloride of mercury solution and proceeded to

make a microscopical examination. Dr. Carl Fisch, of this city, took a small piece from the border of the ulcer and also prepared two smear-specimens from the pus found in the inner canthus. He reported: "There were giant-cells to be seen in the granuloma as well as a small tubercle. With proper staining methods tubercle bacilli could be demonstrated. The pus removed from the inner canthus, too, contained a small number of tubercle bacilli." We also found bacilli in the patient's sputum. I reported these results of the examination to the family physician and also to the surgeon who was attending the fractured femur. Both of them scorned my diagnosis. As soon as I could get the permission of the surgeon I operated on the eyelid.

On October 28th, I curetted the ulcer and then cauterized it with lunar caustic. The next day I cleansed off the eschar and packed the wound with finely-powdered iodoform. I kept up this dressing for four days but had to discontinue it owing to the intense congestion of the ocular conjunctiva and to the fact that the cornea was almost entirely denuded of its epithelium. I then ordered hot fomentations four times a day and frequent cleansing with a solution of bichloride of mercury 1 to 8000. In a little over a week after the curetting a small, firm cicatrix occupied the site of the ulcer. I saw her shortly before her death, which occurred five months after my operation, and the almost imperceptible scar in the conjunctiva was still firm. She died of tuberculosis of the lungs.

Norris says: "Tuberculosis of the conjunctiva, always a rare disease, is seldom seen in this country." Thompson says: "I have never seen a case which was proved to be tubercular by bacterial investigation." Fuchs, de Schweinitz, Norris and Oliver, and Noyes all agree that the disease occurs almost without exception in young subjects.

I would also call attention to the fact that the majority of works on ophthalmology discuss lupus and tuberculosis of the conjunctiva under separate heads, without giving any definite point of differentiation, except that the former is generally an extension of a process which begins in the skin. If they are separate conditions a more distinct differentiation should be made. If they are in reality the same disease, there is no use in describing the disease twice. The case cited is also of interest because an early microscopical examination of the ulcer

might have revealed the existing constitutional condition before the physical signs pointed to it and possibly before the disease had reached the incurable stage.

INTROVERSION OF THE IRIS.*

BY L. W. BEARDSLEY, M.D., ST. LOUIS, MO.

THIS interesting condition, described by various authors as sinking in, collapse, and retroflexion of the iris, was first described by Schmidt¹ in 1804. Since then, von Ammon,² Förster,³ Passauer,⁴ De Wecker,⁵ Samelson,⁶ Taylor,⁷ Parisotti,⁸ Praun,⁹ and Eales and White,¹⁰ have described cases of either the partial or complete variety, with or without dislocation of the lens.

The commonest etiological factor is a contusion, and more especially a contusion caused by a bullet which does not pierce but glances off from the eye. The condition is also seen after operative measures.

Those who have been so fortunate as to secure the affected eye for examination have found that the iris is turned inward, either in part or entirely, the introverted portion lying backward upon the ciliary body, and is invisible. The cases in which there is but partial introversion are rather more frequent than those of the total variety, which is very rare. There is oftentimes an accompanying dislocation of the lens, and nearly always hæmorrhage into the aqueous and vitreous chambers. This hæmorrhage, if profuse, interferes with the proper examination for some time, and we are unable to judge with positiveness what confronts us.

As to the mechanics, there is a variance of opinion, with no clear ideas advanced, and no definite results attained as to finding out how it occurs. Von Ammon says, in referring to his case, "How did it occur? Surely, only by means of the combined concussion of the vitreous body, together with the dislocation of the lens upward, thereby depriving the iris of the

*Read at the twenty-fifth annual meeting of the Mississippi Valley Medical Association, Chicago, Ill., October 6, 1899.

fixed support which the lens provides, permitting it to sink inward. At this moment the return of the vitreous body, followed by the lens, acts upon the iris, preventing its return to the normal position." Förster, however, holds that the pressure of the aqueous upon the periphery of the iris where it is least supported, everts it. As Praun contends, this would necessarily imply a paretic condition of the iris, or there would be a tearing of the sphincter. As this is but infrequently the case, Förster's theory will not apply in all cases. Indeed, after careful weighing, I find there is no satisfactory solution to the problem. That intorsion occurs has been proven by the anatomic researches of various observers, but how it is caused is still an enigma. At least the concussion theory alone will not suffice, for it is sometimes seen after opening the anterior chamber in various operative procedures.

In a case which came under my observation not long since, there were several points of sufficient interest, I believe, to warrant my bringing it before your notice. The history is as follows:

On July 7, 1898, Jno. C., laborer, 34 years of age, was sent to me by Dr. Shanklin, of our city, with the history of having been kicked in the right eye by his three-and-a-half-year-old son, on the fourth day preceding. Upon examination, I found the following state of affairs present: There was a recent scar in the cornea about 3 m.m. long, located about 2 m.m. from the limbus in the upper portion. There were a number of floating opacities in the anterior chamber, of a dark color, like those seen after hæmorrhage. The evidences of irido-cyclitic irritation were quite marked. With the ophthalmoscope I could determine the presence of innumerable opacities in vitreo. These proved afterwards to be partly hæmorrhagic, partly broken up lens matter. There was absolutely no iris visible, nor could any of the ciliary processes be seen, either with the naked eye, or ophthalmoscope. The patient was an illiterate, and with the dots could see $\frac{6}{xv}$ with the normal eye. Vision in the affected eye was reduced to hand movements at 1 meter. I used atropine ointment and applied a compress bandage, which was discontinued on the third day, and a solution of atropine given for home use, in conjunction with hot fomentations. There was a gradual recession of the inflammatory process, and when the opacities had become sufficiently absorbed

I could determine the aphakia. After quiescence resulted, patient could see $\frac{6}{xxiv}$ (dots) with a plus 12.0 spherical lens. A recent examination shows that patient can see $\frac{6}{xv}$ with +12.0 sph., and reads Snellen No. I. with +15.0 sph.

The features of especial interest in the case were the total introversion of the iris, the absorption of the lens in a patient of his age, and the good vision remaining after so severe an injury.

Another case, for the notes of which I am indebted to Dr. C. Barck,¹¹ and which I had the pleasure of seeing through his courtesy, was as follows:

Jno. S., a laborer, of Polish birth, 69 years of age, was violently struck in the right eye with a stone on September 29, 1896. Patient presented himself a few days later. There was no external wound or cicatrix either in the cornea or the sclera. A small amount of blood was present in the anterior chamber. No trace of the iris was visible. The lens was dislocated downward into the vitreous, which was clouded. The fundus was just visible. V. = about $\frac{6}{L}$ with +12.0 sph. As patient's surroundings were very bad, and he declined to go to the hospital, upon which Dr. Barck insisted, the case was lost sight of.

LITERATURE.

- ¹J. A. Schmidt—Schmidt und Himly's Oph., Bd. III., p. 171.
- ²Von Ammon—Arch. f. Ophth., I., 6, p. 119.
- ³Förster—Heidelberg. Berichte, 1887.
- ⁴Passauer—Arch. f. Ophth., XIX., 2, p. 315.
- ⁵DeWecker—Graefe-Saemisch Handb., IV, p. 538.
- ⁶Samelson—Brit. Med. Jour., September, 1872.
- ⁷Taylor—Lancet, II., p. 839.
- ⁸Parisotti—Boll. dell'Acad. Med. di Roma, XVIII., p. 602.
- ⁹Praun—Handbuch, 1899, p. 275.
- ¹⁰Eales and White—Lancet, 3963, p. 412.
- ¹¹C. Barck—Personal Communication.

MEDICAL SOCIETIES.

FROM THE NINTH INTERNATIONAL OPHTHALMOLOGICAL CONGRESS.

BY CHARLES BARCK, M.D., ST. LOUIS, MO.*

The Ninth International Congress of Ophthalmology, held at Utrecht, August 14-18, 1899, was formally opened by Prof. Snellen, Sr., his imposing figure being familiar to all present. It was one of the last acts in his university career, as he intends resigning from his chair on account of advanced age. His eldest son will no doubt be chosen as his successor. (Has since been done).

In his opening address, Snellen paid due tribute to Holland's famous physicians, to whom ophthalmology owes so much—Boerhaave, in the eighteenth, and the lamented Donders in our century, whose demise occurred just previous to the last Congress at Edinburgh. "To the land of Donders," had been the unanimous cry when the question as to the next place of meeting came up.

He then mentioned, with perceptible emotion, the loss which ophthalmology had suffered in the death of Helmholtz. "Let us repeat the words with which Donders addressed that immortal mentor when he presented the first von Graefe medal at Heidelberg: 'To the founder of a new science, to the benefactor of mankind.'"

The Congress was well attended, there being about 400 members present; the different countries were nearly equally represented, the United States having sent at least two dozen, amongst them some of her best known, oculists.

At this Congress an innovation was made which proved anything but satisfactory, namely, the division into three sections—A, anatomy and physiology; B, optics, and C, pathology

*Dr. Barck has kindly promised us a more detailed report at a future date.

and therapeutics. The three sections convened at the same time in different rooms of the University. One of them, the Aula, a former chapel, was large enough, the others proving inadequate. On account of this division, it was naturally impossible to hear all the papers, as at previous congresses, and, furthermore, by trying to select the ones most valuable individually, valuable time was lost in running to and fro. It was the universal sentiment that this was an impracticable arrangement and everywhere the hope was expressed that it would be rectified at the next Congress.

The following papers were read :

SECTION A.

- H. Einthoven—Geometric Optical Illusions.
- J. P. Nuël—The Channels in the Anterior Chamber for Eliminating the Aqueous Humor.
- F. Benoit—Eliminating Channels at the Posterior Pole.
- E. Landolt—A New Stereoscope.
- E. Treacher Collins—Anatomical and Congenital Defects of the Ligamentum Pectinatum.
- M. E. Mulder—Pathologic Anatomical Demonstrations.
- Ole Bull—(1) Drawings and Chromatic Tables. (2) Changes in the Retinal Blood-vessels.
- F. Dimmer—Photographing the Fundus.
- L. Dor—Projection of Photographs from Nature in Colors.
- Th. Axenfeld—Pathologic Anatomical Demonstration.
- J. Mackenzie Davidson—Localizing Foreign Bodies in the Eye by X-Rays.
- K. Grossmann—Localization of Foreign Bodies in the Eye by X-Rays.
- J. von Michel—Pathological Changes in the Ocular Blood-vessels.
- A. Siegrist—Arterio-Sclerosis of the Ocular Blood-vessels.
- S. Theobald—A Case of Detachment of the Retina, with Complete Re-attachment and Restoration of Vision.
- D. Goldzieher—Iritis Glaucomatosa.
- C. Nicolai—The Tension of the Tissues of the Eye.
- W. Schoen—The Three Essential Anatomical Changes of the Glaucoma Process.
- Bietti and Axenfeld—Nerve Degeneration After Neurectomia Optico-Ciliaris and Anterior Ciliary Nerves.

- E. de Gross—Keratitis Neuroparalytica.
 E. Kruckmann—Does a Primary Cancer Occur in the Eye?
 E. Frank—Pathological Anatomy of Ocular Lepra.
 C. Addario—Anatomical and Bacteriological Researches
 Concerning Conjunctivitis Trachomatosa.
 R. Hitschmann—The Pathogenesis of Corneal Dermoids,
 Subconjunctival Lipomata and Congenital Coloboma of the
 Lids.
 F. D. A. C. von Moll—Metastatic Conjunctivitis.
 A. Druault—The Colored Rings Seen Around a Flame in
 the Norm and Pathologically.
 E. von Gross—Tabetic Optic Nerve Atrophy.
 F. Heine—(1) Anatomy of the Myopic Cone (Communi-
 cation from Prof. Hess). (2) Contracted and Relaxed Ciliary
 Muscle (Communication from Prof. Hess).
 W. B. Jessop—Glioma Retinæ.
 A. Neuschueler—The Fibers of the Optic Nerve.
 L. Dor—The Nervi Nervorum of the Chiasma.
 E. Pergens—The Retina of *Leuciscus Rutilus* L.
 K. Grossmann—Listing's Law and Palsy of the Muscles
 of the Eye.
 E. Pflueger—(1) New Chart for the Detection of Color-
 Blindness. (2) Proximate Visual Acuity in Myopia of High
 Degree.
 Greef—The Nature of the So-Called Fuchs' Atrophy of
 the Optic Nerve.

SECTION B.

- M. Tscherning—The Accommodative Changes in the Eye.
 Rogman—The Pseudo-accommodation in the Aphakic Eye.
 Pfalz—Perverse Astigmatism.
 S. Holth—(1) Ophthalmometric Studies. (2) Ophthalmo-
 metric Studies on the Eye after Death.
 L. Howe—The Desirability of Greater Exactness in Ex-
 pressing pupillary Reaction.
 Kempner—New Instrument for Studying Hemianopic Pu-
 pillary Reaction.
 L. J. Lans—Pupil Width
 C. Hess—Accommodation and Convergence.
 G. T. Stevens—The Declination of the Vertical Meridians
 of the Retina.

G. J. Bull—Fatigue from Trying to Maintain Binocular Single Vision.

A. Bielschowsky—Vision of Strabotics.

Pfalz—Influence of Exact Correction in Youth on the Development of Myopia.

W. Koster—The Elasticity of the Sclerotic and Its Relation to the Development of Glaucoma.

Uhthoff—Injury to the Eye by Insolation.

H. Zwaardemaker and L. J. Lans—Refractory Aspects of Eye Reflexes.

Silex—Pseudomonochromasia.

E. Sulzer—Color-Perimetry.

F. Ostwalt—Experimental Studies with Periscopic Glasses.

P. de Obarrio—The Best Visual Acuity.

H. Coppez—Action of Certain Toxins on the Cornea.

O. Neustätter—(1) The Shadows in Skiascopy. (2) Phantom for Skiascopy.

E. Landoldt—Reform in Numbering Prisms.

Ch. H. May—Standard for Measuring the Field of Vision.

F. Schieck—The Primary Changes in Ribbon-Keratitis.

W. Thorner—A New Ophthalmoscope Giving an Image Without Reflexes.

SECTION C.

O. Schirmer—Benign Post-Operative Cyclitis.

M. Straub—Hyalitis.

W. Schoen—Scleritis and Its Connection with Myopia.

O. Haab—Intraocular Disinfection.

H. Dor—Treatment of Retinal Detachment.

E. Motais—New Operation for Ptosis.

H. Sattler—Iron-Cataract.

A. von Hippel—The Lasting Effects of Myopia Operation.

A. Critchett—Operative Treatment of Conical Cornea.

G. A. Berry—Operations for Conical Cornea.

E. Clark—Union of Corneal Wounds.

R. Sattler—(1) Ocular Manifestations of Hyperostosis Cranii. (2) Uncommon Orbital and Ocular Expressions of Maxillary Sinus Disease.

V. Morax—Toxins Producing Conjunctival Inflammation.

Jocqs—Methods to Render the Lens Quickly and Completely Dim Without Tearing the Capsule.

J. Hern—Operative Treatment of Glaucoma.

- Valude—Bactericidal Action of the Tears. Prophylaxis and Treatment of Operative Infection.

Rohmer—Post-Operative Treatment of Cataract.

T. Dianoux¹—Treatment of Corneal Infiltration by Injections of Ocean Salt-Water.

Darier—Ocular Massage, Corneal Massage, Vibratory Massage, Massage Pressure, and Its Action on the Accommodation and Refraction.

Lapersonne—Optic Neuritis Dependent on Sinusitis and Diseases of the Posterior Part of the Nasal Fossæ.

H. Coppez—Treatment of Granulations by Electrolysis.

J. M. Ball—Removal of Cervical Ganglion for Glaucoma.

A. Emrys Jones—The Treatment of Some Complicated Cases of Closed Pupil.

G. Guttmann—Treatment of Complicated cataract.

H. Knapp—Some Rare Tumors of the Orbit.

B. Wickerkiewicz—New Operation for Epicanthus.

E. Böckmann—Pannus Trachomatosus and Its Treatment by Periectomy.

A. Bronner—Sixty Cases of Extraction of Senile Cataract Without Iridectomy.

Darier—Treatment of Conjunctivitis with the Different Silver-Salts.

O. Neustaetter—Washing the Nasal Duct from the Puncta Without Cutting or Stretching.

W. Schoen—Changes Caused in the Infantile Eye by Spasms.

J. Lavage—Treatment of Congenital Nystagmus.

PAMPHLETS RECEIVED.

"A New Model of a Small Ophthalmoscope," by W. L. Pyle, M.D.

"Unilateral Albuminuric Retinitis, with Report of a Case," by W. L. Pyle, M.D.

"Simple Methods of Photographing with the Microscope," by B. A. Randall, M.D.

"Involvement of the Eye and Ear in Cerebro-Spinal Meningitis," by W. Cheatham, M.D.

A DISCUSSION ON THE PATHOLOGICAL SIGNIFICANCE OF SYMPATHETIC IRRITATION, AND ITS CONNECTION, IF ANY, WITH SYMPATHETIC OPHTHALMITIS.

HELD IN THE SECTION OF OPHTHALMOLOGY OF THE BRITISH MEDICAL ASSOCIATION AT ITS SIXTY-SEVENTH ANNUAL MEETING.

I.—F. RICHARDSON CROSS, M.B., F.R.C.S.,

Ophthalmic Surgeon, Bristol Royal Infirmary.

The consideration and discussion of the "Pathological Significance of Sympathetic Irritation," pure and simple, would prove, I think, a matter of considerable difficulty for any of us; but taken in connection with, or in contrast to "Sympathetic Ophthalmitis," the subject is widened and simplified.

I felt great hesitation in accepting the honor of opening this debate. I have but few facts to bring forward with regard to it, and must be content if I can suggest some lines of thought that may be elaborated by some of my distinguished auditors.

An eye that has been injured, either by an accident or through an operation, is frequently associated after a longer or shorter period of time with symptoms of discomfort, or of inflammation in its fellow, the affection in the second eye depending upon the close functional and anatomical association of the organs of sight. Nowhere else in the body are these conditions at all analogous.

The sense organs for taste and smell are practically central and single, and each ear appears to be entirely separated from its fellow, but the intercommunication of the two eyes is most complete, whether we consider the psychical or physiological arrangement and control of the visual nerve tracts, the intercourse of the blood vessels and lymphatics, or the close binocular correlation which constitutes perfect sight, all of which must be to some extent interfered with by any imperfection of either eye.

The word "irritation" was formerly applied to all conditions of the sympathizing eye. Next the term "sympathetic ophthalmia" was introduced. But of recent years a distinct

separation has been made between cases of inflammation "ophthalmitis," and of irritation "neurosis."

The separation depends almost entirely upon the character of the symptoms which are present in the sympathizing eye, and they can be classified under the two separate headings, respectively, of functional and inflammatory.

The functional subjective disturbances typical of sympathetic irritation are weariness of the eye and disinclination for use, uneasiness, tenderness, or pain in the eye or orbital region; blepharospasm, lachrymation, and hyperæmia of the conjunctiva, photophobia, *muscæ*, and photopsia; dizziness or fog-giness of sight; obscurations of longer or shorter duration; transient defects in the visual field, or even temporary blindness; spasm or weakness of accommodation, or abnormal pupil action. A slight redness or haze of the optic papilla may be present, but careful examination of the eye fails to detect any signs of intraocular inflammation.

The objective symptoms of "ophthalmitis" are those of definite inflammation. They are peculiar and almost typical, and usually early implicate the uveal tissues. Impaired function of the pupil is accompanied by iritis, keratitis punctata, and ciliary congestion. The iridocyclitis, usually of a mild, serous type, and at first causing the patient but little discomfort, insidiously implicates the whole uvea, and gives rise to synechiæ of the pupil and to vitreous opacities. Leber is of opinion that the optic nerve is the part first affected, but it is not easy to prove this by clinical observation. Papillitis seems to be absent in many early, well-marked cases of sympathetic uveitis, but, on the other hand, it is often present, sometimes as neuro-retinitis, or even with retinal hæmorrhage or œdema.

The purely "functional" symptoms of irritation compared with the definite "organic" defects present in sympathetic ophthalmitis render the diagnosis between them easy in typical cases, but clinically the two sometimes overlap one another. Cases occasionally present themselves in which doubtful signs of neuritis or of iritis suggest that an irritated eyeball is being threatened with the more serious inflammatory form of sympathetic mischief.

Again, cloudiness of vision affecting the sound eye after an injury to its fellow may be merely a symptom of irritation; but the optic disc should be carefully examined, for slight neu-

ritis may be present without other organic symptoms as the forerunner of a distinctive inflammatory attack.

As illustrative cases, I may mention the classical one of Donders, where a small fragment set up the most severe irritation in the good eye a few weeks after its fellow had been blinded by accident. The pain was intense, and the eye so irritable that for two years the patient could make no use of it, and believed himself to be blind. But in two hours after removal of the exciter it could be fairly well used, and examined accurately as to sight and absence of organic mischief, and it completely recovered.

Lawson¹ gives notes of sympathetic irritation coming on seven months after an injury. Injured eye removed. Complete recovery, and good sight for nearly nine years; then sympathetic inflammation and loss of sight.

I recently saw what seems a typical case of irritation possibly predisposed by some nervous affection, A. S., 44 years of age, who was formerly a porter in a warehouse, but for the past seven years has been unable to work owing to spinal disease. He said that for some time he had been in a nervous excited condition, often waking up at night, and unable to keep quiet in bed. The knee-jerk was somewhat diminished.

While the patient was cutting a stick, at 4 years of age (forty years previously) the knife slipped and wounded his left eye. The wound healed well, and this eye, although blind and somewhat shrunken, has remained quiet ever since.

His right eye was perfectly well until four years ago. Since then the patient has complained of photophobia, recurrent obscurations, lachrymation, and occasional slight conjunctival discharge. He says that the sight is at times quite clear, but at other times so cloudy that he can not see anyone across the street. When this eye is well he can read continuously for almost an hour, but when it is irritable he can not do so for more than a few minutes at a time, owing chiefly to a mistiness which comes over the center of the field, while the periphery remains comparatively clear. The right eye shows no signs of inflammation, no iritis, and no impairment of accommodation, but there is some doubtful haze over the optic nerve. The pupil reacts well to light and distance. Vision $\frac{6}{75}$, J. I at 8 to

¹Royal London Ophthalmic Hospital Reports, Vol. X.

15 inches; with — .50 $\frac{6}{v}$. The left eye is a shrunken stump, probably containing ossifying choroid. Enucleation was advised, but has not yet been accepted.

The patient only paid me one visit, and the actual form of his nervous affection was not fully worked out.

We can not with certainty foretell what kind of damaged eye may give rise to sympathetic mischief, or what one is perfectly free from risk of causing such complication. The exciting eye may be quiet, or may be irritable, or inflamed, when it gives rise to inflammation, or merely to irritation in the sympathizing one.

We know that where sympathizing ophthalmitis proper has occurred some kind of perforating lesion of the exciting eye has been present in nearly every case on record, and that any report to the contrary would be received with caution. It is true that exceptions are found in cases that have been published of "sympathetic ophthalmia" occurring without any visible external wound in the injured eye. In some of these an inflammation of the uvea (iridochoroiditis or cyclitis) has attacked the second eye, at an interval after the first, by reason of a diathetic or other cause common to both, and without any sympathetic connection between the two. In others the lesion has been a subconjunctival rupture of the sclera, caused by a blow. In the majority of cases in this group the sympathizing eye has suffered merely from irritation, but at least seven cases are recorded by reliable observers where definite ophthalmitis resulted, although no rupture through the conjunctiva could be found. Even if we overlook the possibility of small conjunctival wounds escaping observation, are these cases really exceptional? It seems to me doubtful how far a bruised conjunctiva is a reliable protection for the damaged contents of a ruptured eyeball against infection from without. Again, it is possible for organisms to enter an uninjured eyeball from the blood stream, and to cause various well-recognized forms of inflammation in connection with general diseases. Berlin and Hutchinson think that sympathetic eye diseases may be started by affected particles from the exciter circulating in the blood stream, and producing characteristic sympathetic symptoms as soon as they reach and develop in the congenial soil of the opposite uvea.

The original damage in some typical cases of sympathetic

ophthalmitis may be very slight, as for instance a simple intra-ocular operation. Extraction of cataract, or a needling after cataract extraction, has caused it. In many of these cases iritis had complicated the operation, but in some the operated eyes seemed to be quite free of any inflammation throughout, and in a few the sight in them continued to be good, although the removal of the sympathizer was rendered necessary on account of pain or degenerative changes.

Sympathetic irritation also follows punctured wounds; it may soon cease, or may recur from time to time for years without any further complication. It may be relieved by the removal of the exciting eye, or eventually be succeeded by an ophthalmitis. But more usually irritation is caused by old shrunken eyes, particularly if containing painful or ossifying choroid, etc. The irritation of glass eyes in the socket may bring it on. But it is important to recognize that all these conditions may also be productive of ophthalmitis.

Thus several cases are quoted in the reports of Nettleship and of the Ophthalmological Society Committee² where a glass eye has been the cause of sympathetic ophthalmitis, whether worn over a shrunken eyeball, No. 183 (where neuroretinitis and later iridochoroiditis occurred in the sympathizer, which was lost fourteen years after the destruction of its fellow by corneal ulceration) or after enucleation of the eyeball, No. 199 (where glass eyes had been worn in comfort for fifteen years, but a new one set up conjunctival trouble and then plastic iritis, which recovered after about three months).

A shrunken eyeball seems able to excite ophthalmitis when it is quite quiet and apparently devoid of any microscopical evidence of inflammation, or it may have previously become ulcerated or irritable.

Even the optic nerve stump, left after enucleation of an eyeball, may become involved in cicatricial bands or worried in some way so as to cause a sympathetic ophthalmitis (No. 191) in one case, or a sympathetic neuritis in another case, both relieved by further operations on the faulty stumps.

Nor can we be certain as to the length of interval which will separate the injury to the exciting eye from the sympathetic complication whether this be functional or organic.

²Transactions, Vol. VI.

A common period for the development of sympathetic ophthalmitis is two or three months, but many cases commence in two or three weeks, or even earlier. A man came under my notice with well-marked right sympathetic iridochoroiditis. Two years previously he had wounded his left eye with a nail. The right became at once very irritable; he says it was inflamed on the second day. On the seventh day after the accident the left eye was removed by Mr. George Lawson (the right being then very bad and much inflamed), evidently without arresting the sympathetic disease.

On the other hand, out of the 211 cases of ophthalmitis published by the Ophthalmological Society Committee,³ twelve eyes became inflamed as late as twenty years after the injury, the interval in three cases being no less than thirty-seven, thirty-eight, and thirty-nine years respectively.

In sympathetic irritation the period of interval varies just as much. It may be short or very long, so that if we believe these cases to be really sympathetic in their nature, and that they would not have occurred if the damaged eyeball had been earlier removed, we can not feel absolutely safe at any period, nor can we say for certain what the character of the sympathetic mischief will be by the interval which separates it from the original injury. A comparison, however, of the proportional number of cases occurring at different periods would seem to show that typical uncomplicated irritation is much more likely than inflammation to occur after a prolonged interval. Thus, among the cases of which I have record, inflammation set in within the first year in 16 out of 23, while within the same period irritation had developed in only 10 out of 27. In other words, within the first year inflammation was proportionally almost twice as frequent as irritation. Many slight cases of the latter, however, pass unnoticed. Others recur and extend into very lengthened periods after the original injury, while ophthalmitis has one definite commencement, and once established is continuous and nearly always progressively destructive, so that deductions in this direction are not reliable.

The theories used to explain the occurrence either of sympathetic ophthalmitis or of irritation remain suggestive but proven. To speak of one group as a reflex neurosis and of the

³Ibid.

other as a migrating ophthalmia or septic uveitis has done good service as a working hypothesis, but we are still uncertain along what channels either the nerve currents or the infecting particles may pass, or what special kind of organisms may be concerned in the disorder.

Leber found hyperplasia of the optic nerve in nine cases of sympathetic ophthalmitis, and believed the disorder to be always due to septic inflammation, and that the first symptom in the sympathizing eye was neuritis and not iritis. Snellen has also shown the presence of lymphoid cells around the optic nerve,⁴ and Brailey fully describes the microscopical appearances of the cellular infiltration in the affected uvea, in many sympathizing eyeballs. He found a similar condition existing in the exciter, if removed while it was still inflamed, but he has seen many cases of undoubted sympathetic ophthalmitis, where the first eye, possibly a mere stump at the time of the outbreak, was neither tender nor painful, having long been quiet, and several where such, when examined microscopically, presented, at the most but very doubtful signs of present inflammation.⁵

The various experiments by Deutschmann mark an epoch in the study of the disease. In his hands they have been almost conclusive, but they have scarcely received corroboration. Scarcely any other experimenter, whether by injecting into the eye itself or into the lymphatic channels associated with it, has succeeded in establishing any symmetrical inflammation of the eyes that resembled sympathetic ophthalmitis, and while the presence of cellular infiltration has been shown in the exciting or in the sympathizing eyeball, after its removal, many recent investigators deny that micro-organisms can be found in the tissues, while others admit the presence of organisms, but deny the possibility of experimentally producing sympathetic ophthalmia.

If micro-organisms are the essential factor in the causation of this disease, it must at any rate be admitted that the specific organisms in question have not yet been demonstrated.

Some say that sympathetic ophthalmia never occurs in animals, if this is so we could scarcely expect to produce the

⁴Trans. Internat. Med. Congress, 1881.

⁵Trans. Oph. Soc., Vol. IV.

disease by experiment, and many of the negative results may thus be explained.

Some of the latest observations are those of Angelucci,⁶ who gives results of experiments and bacteriological examinations from three cases of sympathetic ophthalmitis. The removed exciting eyes contained micro-organisms, which in cultures showed pathogenic micrococci. A piece of iris was taken from each of the sympathizing eyes, and showed micro-organisms especially in the perivascular spaces. The cultures showed micrococci which when injected into a rabbit's eye caused iridocyclitis, and infiltration along the optic nerve through the chiasma and down the subvaginal space to the other nerve as far as the eyeball.

None of the animals showed sympathetic symptoms in the second eye; they died of general infection possibly before ophthalmia had time to declare itself. These and other experiments lead him to the opinion (1) that eyes suffering from sympathetic ophthalmitis always contain germs, (2) that these travel from the infected eye along the tissues of the optic nerve to the fellow eye, but (3) he does not believe that sympathetic ophthalmia can be artificially produced in animals, and considers the disease to be peculiar to man.

Bach,⁷ experimenting earlier on the same lines with cultures of various micro-organisms, had obtained absolutely negative results. But by means of chemical or mechanical irritants applied to the surface of the eye he produced at once in the fellow eye fibrinous exudations in the aqueous, vitreous, and subretinal space. These were demonstrated by immediate removal of the eye and subsequent examination under the microscope. He concluded that prolonged irritation of an eye produces vascular dilatation and escape of the blood constituents, not only in it but in the fellow eye also, and that sympathizing ophthalmia is thus initiated by a neurotrophic action of the ciliary nerves rather than by the direct agency of bacterial organisms, the intensity and duration of the irritation being of more importance in causation than the nature of the irritant.

In opposing Bach's views Angelucci brings forward arguments against the existence anywhere of special trophic nerve

⁶Rev. Gén. d'Ophthalmologie, 1898.

⁷Oph. Rev., Vol. XV.

fibers, and considers that the results described are due entirely to vasomotor action, and resemble much more an ordinary hyperæmia than the conditions of definite inflammation that characterize sympathetic ophthalmitis.

Dr. Cecil Shaw⁸ has made a series of experiments on rabbits' eyes to determine what changes, if any, follow prolonged irritation, external or internal. Wounds in the ciliary region were made while purulent conjunctivitis was set up by jequirity, and the conditions were in some cases maintained for several months; no iritis occurred in the wounded eye, nor were any abnormal symptoms produced in the fellow. Wounds with soiled instruments and the introduction of shot into the eye through the sclera or into the ciliary region seemed to produce scarcely any symptoms in the one eye or in the other. After death the eyes were removed and hardened, and the examinations under the microscope both for exudations and organic changes in the eyes, and for the presence of micro-organisms were practically negative.

Sympathetic ophthalmitis is usually caused by wounds or perforations of recent date, particularly in the ciliary region, or complicated with prolapse of the iris, conditions favorable for infection by organisms, but it is certainly rare after severe suppurative inflammation has taken place. Panophthalmitis of the exciter often causes irritation of the fellow, but seldom inflammation.

This fact has been used against the migratory theory, but it is not likely that the pus-producing cocci are those responsible for sympathetic neuritis or uveitis, and indeed the former organisms may be antagonistic to or destructive of the latter. The inflammatory exudation also may seal up the channels of communication in the eye and prevent the transit of micro-organisms. In this connection I may remind you how many cases of fatal cerebral meningitis have occurred after excision of a suppurating eyeball; it would seem as though the operation opened up a passage for the pus organisms from the eye to the brain, possibly along the perivascular lymph spaces or those of the optic nerve, or by means of the cavernous sinus, and this hypothesis is rendered more probable by the fact that closure of the orbit by over-bandaging seems to increase the

⁸British Medical Journal, 1898, Vol. I., p. 1580.

risk of meningitis, while free washing and drainage diminish if they do not entirely remove it. Here as in the case of many of the injection experiments which have been made in order to cause sympathetic ophthalmitis the organisms set up inflammation of the brain, while there is no evidence of the other eye becoming affected. The inflammation of a sympathizing eye is never suppurative.

Cerebral meningitis very rarely results from an injury to the eyeball or as a complication of sympathizing ophthalmitis. Snellen,⁹ however, gives notes of a case of acute meningitis occurring simultaneously with sympathetic ophthalmitis. Microscopic examination of the exciting eye showed the uvea to be infiltrated with lymphoid cells, which were also abundant in the tissue surrounding the optic disc and in the subdural space of the optic nerve. A few other cases have been recorded.

Enucleation of wounded eyeballs in which no inflammation has been present, or even where inflammation has been very slight, has on several occasions been rapidly followed by fatal meningitis. Nettleship seems to think¹⁰ that risk from this cause (excision of eyeballs) is not very materially increased by the presence of suppuration in the eye.

A very few cases have been published of fatal meningitis following intraocular operations. (1) Seven days after a cataract extraction in a woman 70 years of age (Knapp). (2) Four days after needling opaque capsule in a child one year of age (Warlomont). (3) Thirteen days after iridectomy for secondary glaucoma following cataract extraction in a woman 68 years of age.

Very little opportunity is afforded for paying attention to the pathology of sympathetic irritation. The old theory of a "reflex neurosis," which has been deposed by that of "migratory ophthalmia," is now made use of to explain it. The symptoms in many cases are such as might be caused by an afferent irritation from the exciting eye being carried along the ciliary branches to a nerve center, whence the efferent impulses pass to the sympathizing eye. These may cause defective or altered nutritive conditions in the tissues of the eyeball, or a diminished power of resistance to disease.

⁹Trans. Internat. Med. Congress, 1881.

¹⁰Trans. Oph. Soc., Vol. VI.

In other cases, however, the affection would appear to be due to the presence in the sympathizing eye of organisms, capable for the time being of causing an irritation only, but liable at any time later to give rise to a definite inflammation.

We have often observed that a secondary operation on or an injury to an eye that has been damaged or has undergone a former operation, is not devoid of risk. Persistent inflammation of a low type not infrequently results. This may depend upon the *materies morbi* (which had been quiet, or possibly encapsuled, after the earlier wound) becoming active.

Deutschmann¹¹ in some of his earlier injection experiments which were negative considered "that the spores did not excite the inflammatory process by germination, for they remained unaltered and became enclosed in masses of pus corpuscles and young spindle cells. To this encapsulation by which the spores were rendered innocuous he attributed the fact that the sympathetic process may become retrograde."

It is sometimes risky to undertake an improving operation on an injured eyeball of some years' standing not only for the eye itself, but because it may set up serious irritation or even sympathetic ophthalmitis in its fellow. The simple needling of an opaque capsule after cataract extraction has caused such a result.

A permanent damage to the eye seems to be inflicted in some cases of sympathetic irritation. Thus, Brailley¹² quotes 29 cases where enucleation of the exciter was performed to relieve irritation; 16 were cured, while 13 were uninfluenced or rendered worse. If the irritation in these cases was a pure neurosis set up by the injured eye, why were they not all cured by the removal of the cause?

Irritation often continues for years without any inflammation occurring, or it may last only a few days before inflammation follows it. The temporary irritation which seems to culminate in inflammation would appear to be different in its causation from that which occurs independently.

I regret that neither my own personal experience nor what I have been able to gather from the writings of others has en-

¹¹Oph. Rev., II., 23.

¹²Trans Oph. Soc., Vol. IV.

abled me to deal in a more capable manner with the pathological significance of sympathetic irritation.

I have no doubt that a seriously damaged eyeball is prejudicial more or less to its fellow, and may predispose it to various kinds of discomforts, if not diseases, and that those which possess no useful sight should be removed or eviscerated, while a shrunken globe interferes with the safe wearing of a glass eye, and may at any time become a source of danger. A degenerated inflamed eyeball seems likely to make an excellent incubator for micro-organisms, and it is certainly damaging to the general health, which I have often seen materially benefited by its removal. Synechiæ and cicatricial pressure or traction should be, if practicable, relieved; but the rules of conservatism in surgery should not be overstated in order to retain blind and often dangerous eyes. The good practice initiated by Augustin Prichard for the removal of eyeballs in association with sympathetic troubles should be still further extended, and an eye that is neither comely nor useful, which is in any degree a possible source of mischief to its fellow, should be enucleated.

[TO BE CONCLUDED].

A SIGN OF THE TIMES.—The following letter throws a sidelight on the manner in which some oculists gather shekels. If there were no such, no man would have the effrontery to send such a circular letter to the profession:

ST. LOUIS, MO., September 25, 1899.

DR.

DEAR SIR: If you will favor me with a portion or all of your prescriptions in my line, I will agree to allow you 50 per cent on the work you send, and will furthermore agree to not charge your patients in excess of legitimate or market prices for the goods they purchase. I make this proposition with a view to advancing our mutual interests, and for my protection against competitors in business who have adopted similar, but unfair methods.

Trusting the above will meet with your approval, and soliciting your patronage and investigation, I remain,

Yours respectfully, S. S. DREIFUS.

NEWS ITEMS.

THE BROMOHYDRATE OF ARECOLINE is a white, crystalline, soluble salt, which when applied to the eye in the form of a one-half or one per cent. aqueous solution causes contraction of the pupil. A one half per cent. solution dropped into the conjunctival sac causes burning and slight conjunctival congestion. In from three to five minutes the pupil begins to contract and reaches its maximum in from ten to fifteen minutes, accompanied by spasm of the ciliary muscle. The maximum effect remains for a quarter of an hour or so, after which the pupil gradually returns to its normal condition, usually in the course of an hour or two. The tension of the normal eye does not seem to be affected by it, but in cases of glaucoma clinical results show this drug to be the equal of eserine. Bietti observed that it appeared to act more promptly and more energetically than eserine, but that its effect was of shorter duration. It keeps well in solution, retaining its active properties unchanged for an unlimited period.

CONCERNING THE IMAGINATION REFLEX OF THE PUPILS OF THE BLIND.—J. Piltz continues his investigations in regard to the imagination reflex of the pupils in cases of blind individuals. The conclusions arrived at are as follows:

1. The pupils of the blind, which by side illumination, do not react to the light, react to central (axial) illumination. From this follows: (a) that the pupillary fibers are found principally in the macula lutea and its neighborhood; (b) that the pupillary fibers can remain undisturbed in those who are totally blind, whose optic fibers have been totally degenerated for a long time.

2. The pupils of the blind become narrowed when the thought of light takes place (even after atrophy of the retina).

3. The pupils of the blind become wider when the idea of a dark object is in the patient's mind (even when the retina is atrophied).—*Med. Rev.*